SYNOPSIS

Title of the Thesis:

COMPARATIVE STUDY OF CHARACTERISTICS OF SOLVENT FREE ORGANIC COATING WITH CONVENTIONAL AND NANO FILLER

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Nano coating utilize nano structured material which will give a lot of efforts and improve coating technologies mostly like corrosion resistant because of greater surface activity with well dispersion of nanoparticales, in the resin through containing cross linking agent with lot of linkage group and gives three dimensional network rigid structures with desirable properties. These molecular networks form a very high crosslink density coating with remarkable physical properties including extreme scratch resistance, ultra high gloss, very high water and chemical resistance, extreme UV resistance, remarkable flexibility and cleaning properties. Such nanoparticles when incorporated in coating, physical properties of the system get altered without affecting the clarity. Tiny size of nanoparticles produces extra ordinary high surface energy.

From the last decade convectional filler like TiO_2, Al_2O_3, SiO_2 and $CaCO_3$ are mostly studied in the paints industry. But our focus should be out of these, fumed silica is is selected for nano filler which finely dispersed, amorphous form of silica. It is produced through high-temperature hydrolysis of silicon tetrachloride in an oxyhydrogen gas flame, give highly pure product. In the Aerosil (R972) manufacturing process, the primary particles that are created are nearly spherical and devoid of pores. This product exhibits a specific surface area (measured using the BET method) of 110 ± 20 m^2g^{-1}, with a primary particle size (PPS) of 12 nm and achieved by treating SiO_2 with dimethyl dichloro silane (DDS). Hydrophobic fumed silica is employed to enhance and sustain the flow characteristics of powders, thicken water-resistant systems, and develop anticorrosive coatings. It offers rheology control for intricate liquid systems and displays water resistance, facilitating hydrophobization of liquid systems. In coatings, it serves as an anti-settling agent, aids in pigment stabilization. Different formed of silica is also economically and environmentally eco friend which is easily available and

industrial affordable. Quartz silica used as conventional filler which is used for comparative study of both composite coatings. From a lot of advantages of these nano filler in paints following test to be carried:

➢ Plan of the Work

- ✓ Development of Epoxy based Composite Coatings and their Characterizations
- ✓ Development of polyurethane based Composite Coatings and their Characterizations
- ✓ Development of Coal Tar Epoxy based Composite Coatings and their Characterizations
- ✓ Development of vinyl ester based Composite Coatings and their Characterizations

➢ Characterizations

So, following characterizations technique to be carried out:

- ✓ FTIR of each film analysis to be carried out before and after salt spray of each film
- ✓ XRD of cured each composite film
- ✓ Particle size determination by Transmissioin Electron Microscope (TEM) of each nanocomposite film
- ✓ Morphology study by Scanning Electron Microscope (SEM) of each composite film
- ✓ Thermal (TGA-DTA) study of each composite film

➢ Physico-Mechanical Testing

Following test to be carried out as per ASTM method:

- ✓ To determinate DFT (Dry Film Thickness) of each coated MS panel
- ✓ Coating holiday test of all coated MS substrate
- ✓ Determination of cross linking density of all composite films
- ✓ Adhesion test
  - Pull off (Before and after of salt spray of each coated panel)
- ✓ Flexibility test of each coated tin panel
- ✓ Hardness test
  - Scratch Hardness of each coated MS panel
  - Pencil Hardness of each coated MS panel
- ✓ Falling ball impact test of each coated MS panel
- ✓ Abrasion resistance of each coated MS panel
- ✓ Gloss meter to measure the specular reflection angle of a coated surface of MS panel
- ✓ Water permeability test of each composite film
- ✓ Chemical resistance test of each composite film

➢ Corrosion Studies

Corrosion Studies of all composite coatings to be carried out following method:

- ✓ Potentiodynamic Polarization (PD) study of uncoated and coated MS rod
- To evaluate corrosion inhibition efficiency after PD studies
- To calculate porosity of each composite coating after PD studies
- ✓ Electro Impedance Spectroscopy (EIS) study uncoated and coated MS rod
- To determinate charge transfer resistance (Rct) after EIS studies

- ✓ Salt Spray Chamber (SSC) test will be carry out 2200 hours for each sample of cured panel and film
- ✓ Cathodic disbondment (CD) study of each coated panel
- ✓ Optical images analysis before and after corrosion studies of all composite coated MS rod